



Low Power, 3V, RS-232 Line Drivers/Receivers

Preliminary Tech Information

ADM3202/ADM3222/ADM1385

FEATURES

230 kbits/s Data Rate Guaranteed
Low Power Shutdown (ADM3222E & ADM1385)
DIP, SO, SOIC & TSSOP Package Options
Upgrade for MAX3222/32 and LTC1385

APPLICATIONS

General Purpose RS-232 Data Link
Portable Instruments
PDA's

GENERAL DESCRIPTION

The ADM3202/ADM3222/ADM1385 are high speed, 2-channel RS232/V.28 interface devices which operate from a single +3.3 V power supply.

Low power consumption and a shutdown facility (ADM3222/ADM1385) makes them ideal for battery powered portable instruments.

The ADM3202/ADM3222/ADM1385 conforms to the EIA-232E and CCITT V.28 specifications and operate at data rates up to 230 kbps.

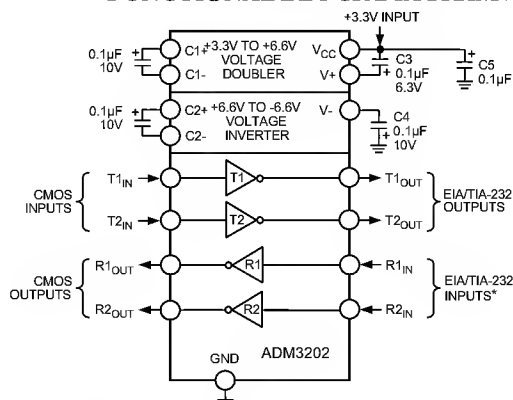
Four external 0.1 μ F charge pump capacitors are used for the voltage doubler/inverter permitting operation from a single +3.3 V supply.

The ADM3222/ADM1385 contains additional enable and shutdown circuitry. The EN input may be used to three-state the receiver outputs. The SD input is used to power down the charge pump and transmitter outputs reducing the quiescent current to less than 1 μ A. The receivers remain enabled during shutdown unless disabled using EN.

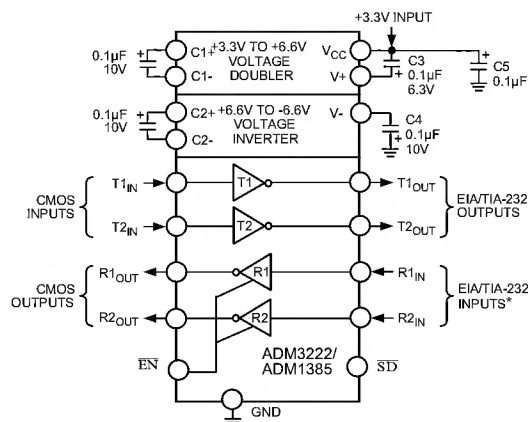
The ADM3202 is available in a 16-lead DIP, narrow & wide SO as well as a space saving TSSOP package. The ADM3222 is available in 18 lead DIP, SO and in 20 lead SSOP and TSSOP.

The ADM1385 is available in a 20 lead SSOP package. This is pin compatible with the LTC1385 CG.

FUNCTIONAL BLOCK DIAGRAMS



NOTE
*INTERNAL 5k Ω PULL-DOWN RESISTOR ON EACH RS-232 INPUT



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ORDERING GUIDE

Model	Temperature Range	Package Option
ADM3202AN	-40°C to +85°C	N-16
ADM3202ARN	-40°C to +85°C	R-16N
ADM3202ARW	-40°C to +85°C	R-16W
ADM3202ARU	-40°C to +85°C	RU-16
ADM3222AN	-40°C to +85°C	N-18
ADM3222AR	-40°C to +85°C	R-18
ADM3222ARS	-40°C to +85°C	RS-20
ADM3222ARU	-40°C to +85°C	RU-20
ADM1385ARS	-40°C to +85°C	RS-20

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Preliminary Tech Information

ADM3202/ADM3222/ADM1385—SPECIFICATIONS ($V_{CC} = +3.3\text{ V} \pm 10\%$, C1–C4 = 0.1 μF . All specifications T_{MIN} to T_{MAX} unless otherwise noted.)

Parameter	Min	Typ	Max	Units	Test Conditions/Comments
DC CHARACTERISTICS					
Operating Voltage Range	3.0	3.3	5.5	Volts	No Load R _L = 3 kΩ to GND
V _{CC} Power Supply Current		1.2	2.0	mA	
		8	10	mA	
ShutDown Supply Current			1	μA	
LOGIC					
Input Logic Threshold Low, V _{INL}	2.0		0.8	V	T _{IN}
Input Logic Threshold High, V _{INH}				V	T _{IN}
CMOS Output Voltage Low, V _{OL}			0.4	V	I _{OUT} = 1.6 mA
CMOS Output Voltage High, V _{OH}		V _{CC} -0.6		V	I _{OUT} = −1 mA
Input Leakage Current		0.01	±1	μA	T _{IN} = GND to V _{CC}
Output Leakage Current			±10	μA	<u>EN</u> = V _{CC}
RS-232 RECEIVER					
EIA-232 Input Voltage Range	−30		+30	V	
EIA-232 Input Threshold Low	0.6	1.2		V	
EIA-232 Input Threshold High		1.5	2.4	V	
EIA-232 Input Hysteresis		0.3		V	
EIA-232 Input Resistance	3	5	7	kΩ	
RS-232 TRANSMITTER					
Output Voltage Swing	±5.0	±5.4		Volts	V _{CC} = 3.3 V. All Transmitter Outputs Loaded with 3 kΩ to Ground
Transmitter Output Resistance	300			Ω	
RS-232 Output Short Circuit Current		±8		mA	V _{CC} = 0 V, V _{OUT} = ±2 V
Output Leakage Current			±25	μA	SD = Low, VOUT = 12V
TIMING CHARACTERISTICS					
Maximum Data Rate	230			kbps	V _{CC} = 3.3 V, R _L = 3 kΩ to 7 kΩ, C _L = 50 pF to 1000 pF. One Tx Switching
Receiver Propagation Delay					R _L = 3 kΩ, C _L = 1000 pF
TPHL		0.3	1	μs	
TPLH		0.3	1	μs	
Transmitter Propagation Delay		1.2	1.5	μs	
Receiver Output Enable Time		200		ns	Measured from +3 V to −3 V or −3 V to +3 V
Receiver Output Disable Time		200		ns	
Transmitter Skew		TBD		ns	
Receiver Skew		TBD		ns	
Transition Region Slew Rate					R _L = 3 kΩ, C _L = 2500 pF, TA = 25°C
	6	10	30	V/μs	
	4	10	30	V/μs	

Specifications subject to change without notice.

ABSOLUTE MAXIMUM RATINGS*

(T_A = +25°C unless otherwise noted)

V _{CC}	..... -0.3 V to +6 V
V+	..... (V _{CC} - 0.3 V) to +14 V
V-	..... +0.3 V to -14 V
Input Voltages	
T _{IN}	..... -0.3 V to (V+, +0.3 V)
R _{IN}	..... ±30 V
Output Voltages	
T _{OUT}	..... ±15 V
R _{OUT}	..... -0.3 V to (V _{CC} + 0.3 V)
Short Circuit Duration	
T _{OUT}	..... Continuous
Power Dissipation	
Power Dissipation N-16	..... 450 mW
(Derate 6 mW/°C above +50°C)	
θ _{JA} , Thermal Impedance	..... 117°C/W

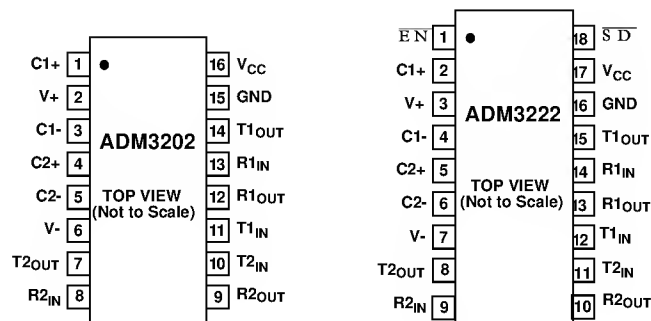
Power Dissipation R-16	..... 450 mW
(Derate 6 mW/°C above +50°C)	
θ _{JA} , Thermal Impedance	..... 158°C/W
Power Dissipation RU-16	..... 500 mW
(Derate 6 mW/°C above +50°C)	
θ _{JA} , Thermal Impedance	..... 158°C/W
Operating Temperature Range	
Industrial (A Version)	..... -40°C to +85°C
Storage Temperature Range	..... -65°C to +150°C
Lead Temperature (Soldering, 10 sec)	..... +300°C

*This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operation sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods of time may affect reliability.

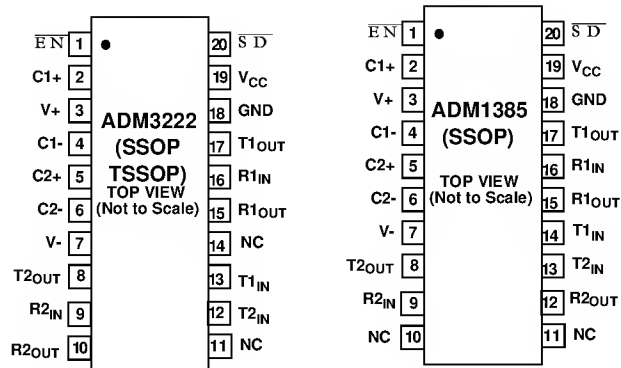
PIN FUNCTION DESCRIPTION

Mnemonic	Function
V _{CC}	Power Supply Input: +3.3 V ± 10%.
V+	Internally Generated Positive Supply (+6 V nominal).
V-	Internally Generated Negative Supply (-6 V nominal).
GND	Ground Pin. Must Be Connected to 0 V.
C1+, C1-	External Capacitor 1 is connected between these pins. 0.1 μF capacitor is recommended but larger capacitors up to 47 μF may be used.
C2+, C2-	External Capacitor 2 is connected between these pins. 0.1 μF capacitor is recommended but larger capacitors up to 47 μF may be used.
T _{IN}	Transmitter (Driver) Inputs. These inputs accept TTL/CMOS levels.
T _{OUT}	Transmitter (Driver) Outputs. These are RS-232 signal levels (typically ±9 V).
R _{IN}	Receiver Inputs. These inputs accept RS-232 signal levels. An Internal 5 kΩ pull-down resistor to GND is connected on each input.
R _{OUT}	Receiver Outputs. These are CMOS output logic levels.
EN	(ADM3222/ADM1385) Receiver Enable, Active Low. When low, the receiver outputs are enabled. When high, they are three-stated.
SD	(ADM3222/ADM1385) Shutdown Control. Active Low. When low, the charge pump is shut down and the transmitter outputs are disabled.

PIN CONNECTIONS DIP, SO



PIN CONNECTIONS SSOP, TSSOP



ADM3202/ADM3222/ADM1385

GENERAL DESCRIPTION

The ADM3202/ADM3222/ADM1385 are RS-232 line drivers/receivers. Step-up voltage converters coupled with level shifting transmitters and receivers allow RS-232 levels to be developed while operating from a single +5 V supply.

Features include low power consumption, and high transmission rates.

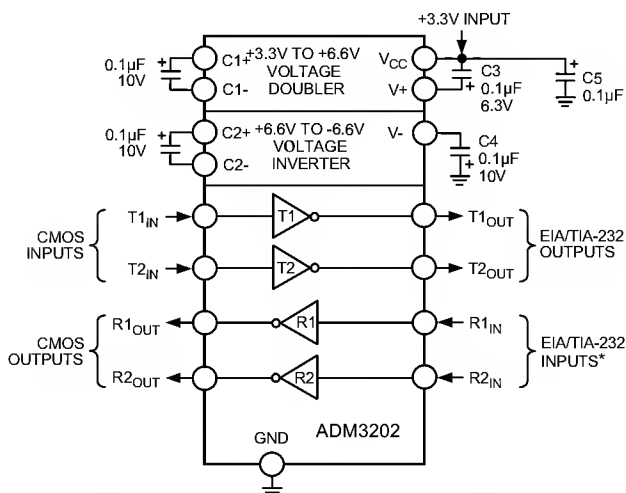
CMOS technology is used to keep the power dissipation to an absolute minimum allowing maximum battery life in portable applications.

The ADM3202/ADM3222/ADM1385 is a modification, enhancement and improvement to the AD230-AD241 family and its derivatives. It is essentially plug-in compatible and does not have materially different applications.

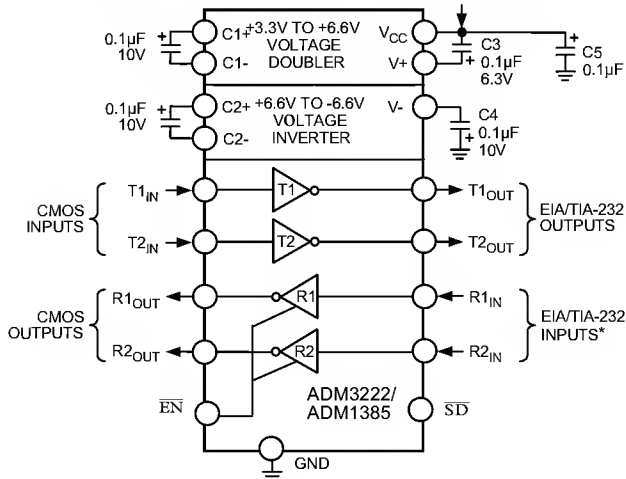
CIRCUIT DESCRIPTION

The internal circuitry consists of four main sections. These are:

1. A charge pump voltage converter
2. 3.3 V logic to EIA-232 transmitters
3. EIA-232 to 5 V logic receivers.



NOTE
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Charge Pump DC-DC Voltage Converter

The charge pump voltage converter consists of an 200 kHz oscillator and a switching matrix. The converter generates a $\pm 6.6V$ supply from the input +3.3 V level. This is done in two stages using a switched capacitor technique as illustrated below. First, the +3.3 V input supply is doubled to +6.6 V using capacitor C1 as the charge storage element. The +6.6V level is then inverted to generate -6.6 V using C2 as the storage element.

Capacitors C3 and C4 are used to reduce the output ripple. Their values are not critical and can be increased if desired. Capacitor C3 is shown connected between V₊ and V_{CC}. It is also acceptable to connect this capacitor between V₊ and GND.

If desired, larger capacitors (up to 47 μF) can be used for capacitors C1-C4. This facilitates direct substitution with older generation charge pump RS-232 transceivers.

Transmitter (Driver) Section

The drivers convert 3.3 V logic input levels into RS-232 output levels. With V_{CC} = +3.3 V and driving an RS-232 load, the output voltage swing is typically $\pm 6 V$.

Receiver Section

The receivers are inverting level shifters which accept RS-232 input levels and translate them into 5 V logic output levels. The inputs have internal 5 kΩ pull-down resistors to ground and are also protected against overvoltages of up to $\pm 30 V$. Unconnected inputs are pulled to 0 V by the internal 5 kΩ pull-down resistor. This, therefore, results in a Logic 1 output level for unconnected inputs or for inputs connected to GND.

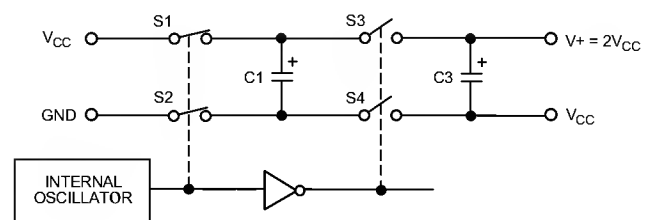


Figure 1. Charge Pump Voltage Doubler

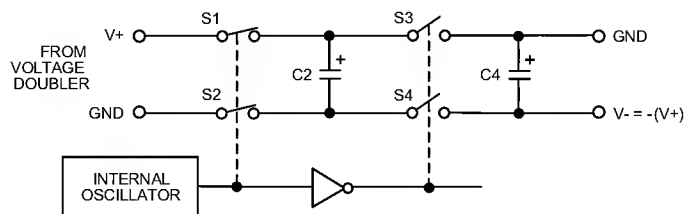


Figure 2. Charge Pump Voltage Inverter

The receivers have Schmitt trigger inputs with a hysteresis level of 0.5 V. This ensures error-free reception for both noisy inputs and for inputs with slow transition times.

HIGH BAUD RATE

The ADM3202E/ADM3222E feature high slew rates permitting data transmission at rates well in excess of the EIA/RS-232-E specifications. RS-232 voltage levels are maintained at data rates up to 230 kb/s even under worst case loading conditions. This allows for high speed data links between two terminals or indeed it is suitable for the new generation I_{SDN} modem standards which requires data rates of 230 kbps. The slew rate is internally controlled to less than 30 V/ μ s in order to minimize EMI interference.

Typical Performance Curves

Typical Performance Curves

Figure 6. Transmitter Output Voltage High/Low vs. Load Capacitance @ 230 kbps

Figure 7. Transmitter Output Voltage High vs. V_{CC}

Figure 8. Charge Pump V_+ , V_- vs. Current

Figure 9. Transmitter Output Voltage Low/High vs. Load Current

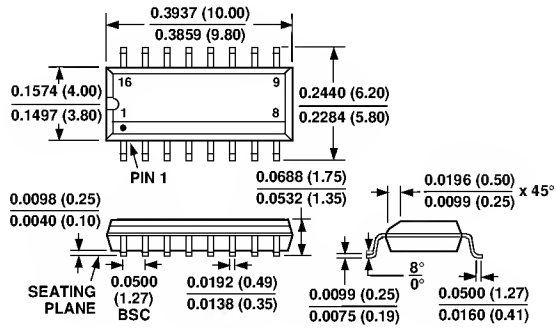
Figure 10. 230 kbps Data Transmission

Figure 11. Charge Pump Impedance vs. V_{CC}

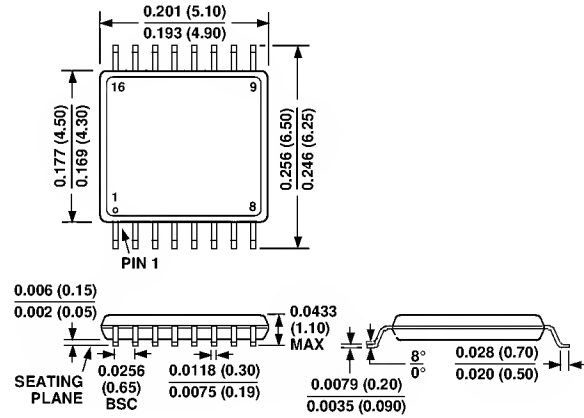
OUTLINE DIMENSIONS

Dimensions shown in inches and (mm).

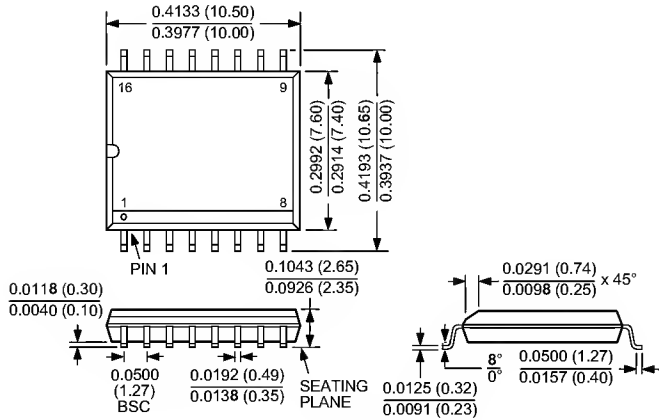
**SOIC (Narrow) Package
(R-16N)**



**TSSOP Package
(RU-16)**



**SOIC (Wide) Package
(R-16W)**



**DIP Package
(N-16)**

